MEMORANDUM

EVALUATION OF TRIPLE SIMULTANEOUS
PARALLEL ILS APPROACHES SPACED 3400 FT APART
USING THE FINAL MONITOR AID AND A SIMULATED RADAR
WITH A 2.4 SECOND UPDATE RATE

30 May 2001

In May 1991, the Multiple Parallel Approach (MPAP) Technical Working Group (TWG) commissioned a real-time Air Traffic Control simulation at the FAA Technical Center. The simulation was designed to examine the air traffic control procedures for simultaneous Instrument Landing System (ILS) approaches to three runways spaced 3400 ft apart. This study was part of an on-going effort to evaluate increases in air traffic capacity using multiple simultaneous parallel ILS approaches. Due to problems in data storage, the simulation could not be analyzed completely. Accordingly, the MPAP TWG was unable to develop a recommendation concerning this operation.

The simulated airport configuration had three parallel runways spaced 3400 ft apart with a field elevation of 600 ft. The Precision Runway Monitor (PRM) system was used in this simulation. A radar system with a 2.4 second (s) update rate and 1 milliradian accuracy was simulated and controllers monitored traffic using the Final Monitor Aid (a high resolution display equipped with a conflict alert system). The air traffic consisted of both flight simulators and computer-generated aircraft which emulated turbojets, turboprops, and propeller-driven aircraft.

To study the proposed operation, scripted scenarios were developed to create conflict situations between aircraft. "Blunders" were generated by having an aircraft deviate from the localizer by either 20 or 30 degrees toward the path of an aircraft on an adjacent runway. Pilots in 62 percent of the blundering aircraft were instructed to disregard controller communications, simulating an inability to correct the deviation.

The purpose of this study was to examine the ability of the controllers to maintain the test criterion miss distance of at least 500 ft between blundering aircraft and aircraft on adjacent parallel approaches. Two questions were addressed:

1. Could the controllers issue corrective actions so that a blunder did not result in a test criterion violation (TCV)? A TCV occurred when two aircraft came within 500 ft of each other. A TCV rate was calculated using the ratio of TCVs to the total number of blunders considered.

2. Did the controllers, technical observers, the MPAP TWG, and other FAA management observers agree that the proposed triple simultaneous parallel ILS approach

operation was acceptable, achievable, and safe using the proposed runway configuration and simulation parameters?

Early simulations in the MPAP (including this one) considered all of the blunders in the analysis of the TCV rate. A simulation was considered successful if less than 2% of all blunders resulted in TCVs. In this simulation, there were 7 TCVs, not including a TCV between two evading aircraft. There was a total of 364 blunders. The overall TCV rate, calculated by the original method, was less than 2%. This result would have met the TCV criteria in use at the time of the simulation.

Procedures for MPAP simulations have been enhanced significantly since the conduct of this simulation. Enhancements enabled the MPAP TWG to determine that a limited number of blunder situations resulted in the severe conflicts. These situations were based upon aircraft alignment on the approach course, blunder degree, and the ability of the blundering aircraft to respond to controller instructions. With this greater understanding of the nature of parallel approaches, the MPAP TWG began to focus their analyses of proposed operations on the outcome of these severe conflicts.

The TWG first identified the 30-degree non-responding blunder as a worst-case situation. Analyses were then focused on this condition. In this simulation, there were only 186 30-degree non-responding blunders. If this simulation were analyzed using the worst-case methodology the TCV rate would have been 3.8% (7/186).

Further development in analytic tools enabled the TWG to restrict their assessment to only those aircraft which were longitudinally aligned at blunder start. This condition was denoted as being “at-risk”. An at-risk blunder would have resulted in a TCV had the controller and/or aircrew response been insufficient. Unfortunately, technical problems were identified in the aircraft track files from this simulation. These data were not retrievable for re-analysis, preventing in-depth examination of the aircraft alignment needed for the identification of at-risk status.

Due to the inability to re-analyze the simulation data and the frequency of TCVs resulting from worst-case blunders (3.8%), the TWG could not make recommendations about simultaneous ILS approaches to three runways spaced 3400 ft apart based on this simulation. Until the MPAP TWG has conducted additional analyses or simulations of this procedure, this investigation shall be rendered closed.